



## The role of institutions in the uptake of climate change adaptation innovations: a comparative study in the coffee based farming system of Central Kenya

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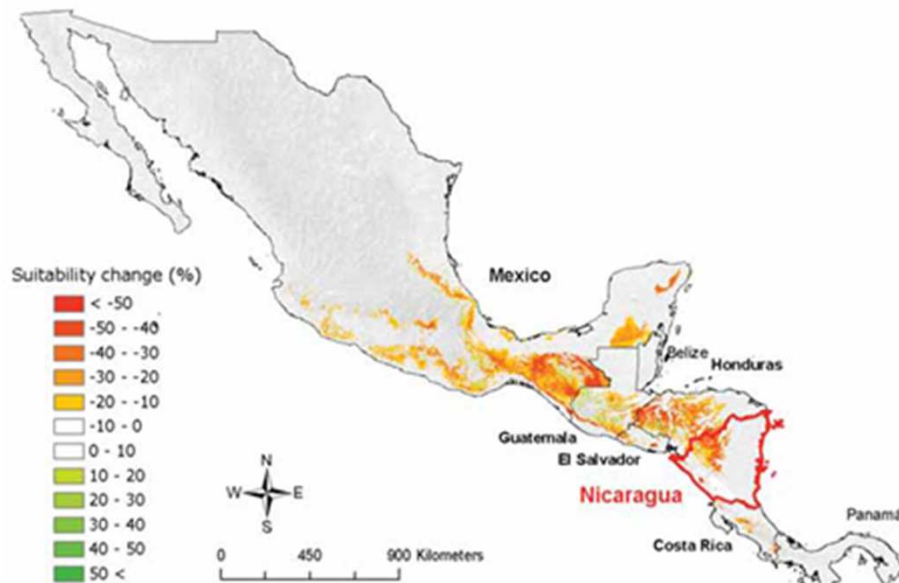


# Presentation Plan

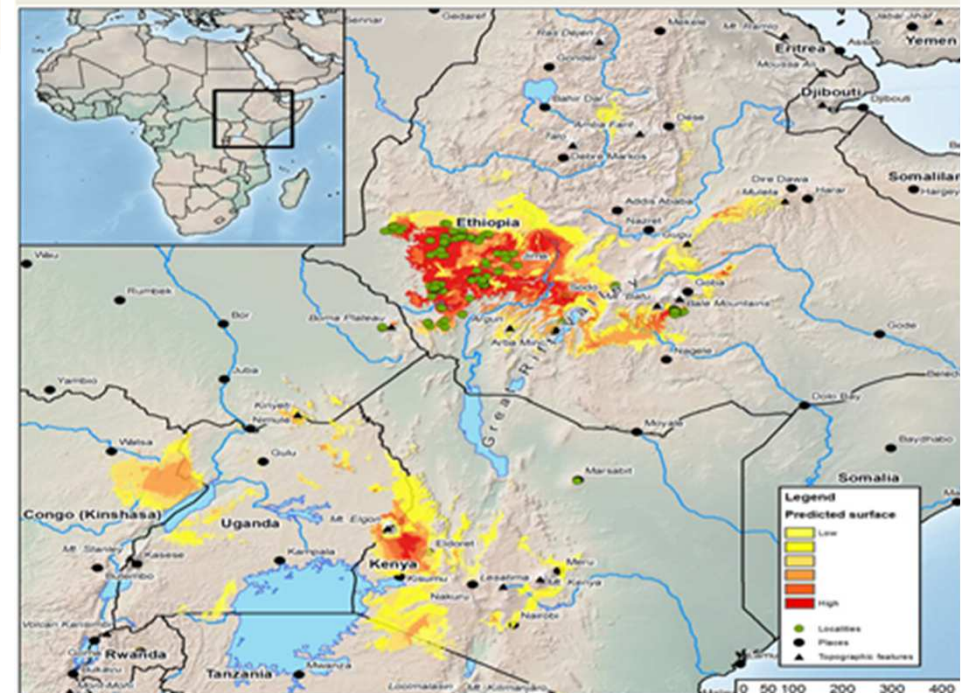
- 1) Introduction
- 2) The areas of study
- 3) Data and methods
- 4) Results
  - 4.1. Defining the induced technological innovation
  - 4.2. Technological (coffee and Dairy) innovation
  - 4.3. institutional building
  - 4.4. Contribution of the transition to household food security

## Coffee production trends

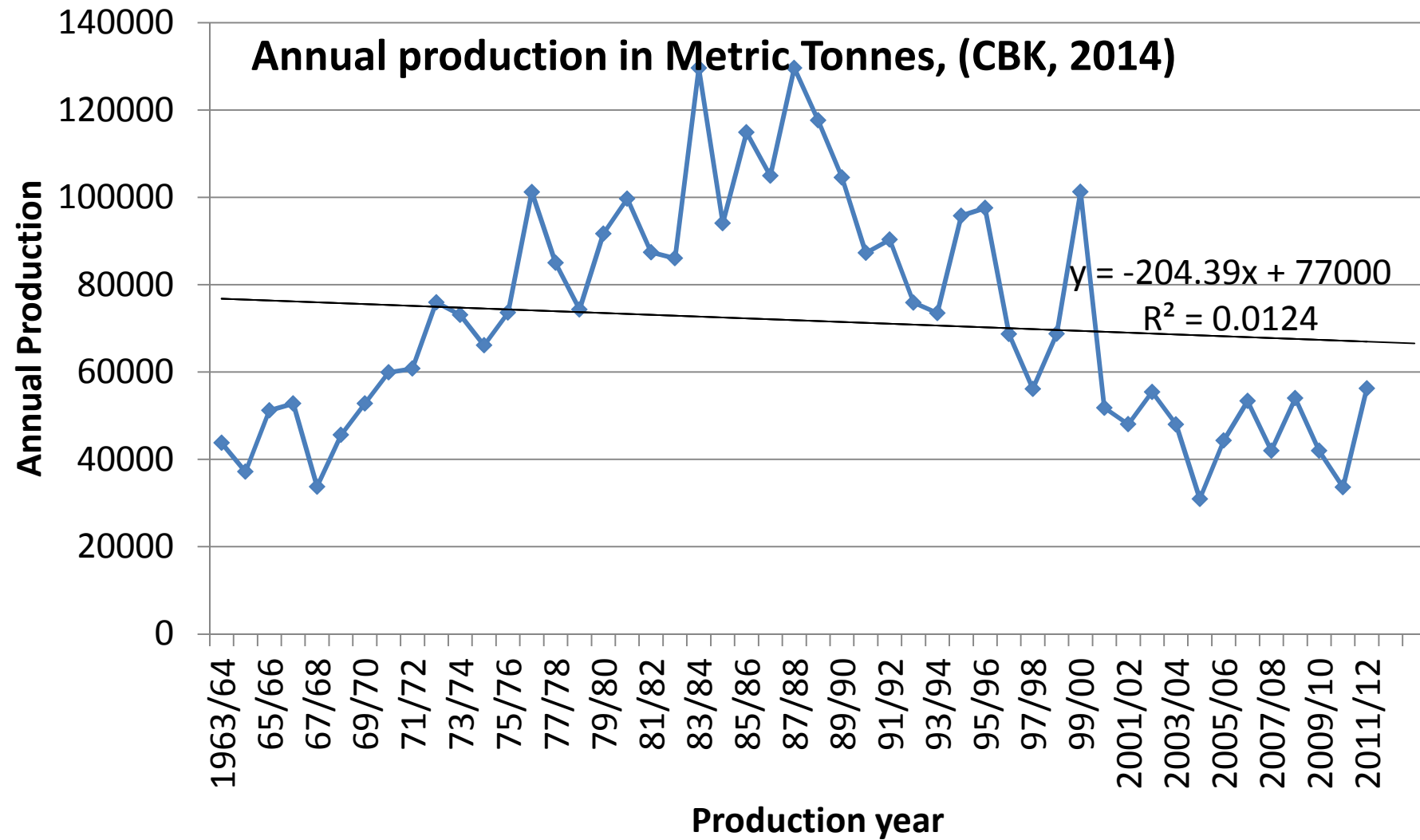
Climate change impacts on coffee production  
*future coffee suitability in Mesoamerica, A.Eitzinger, 2010*



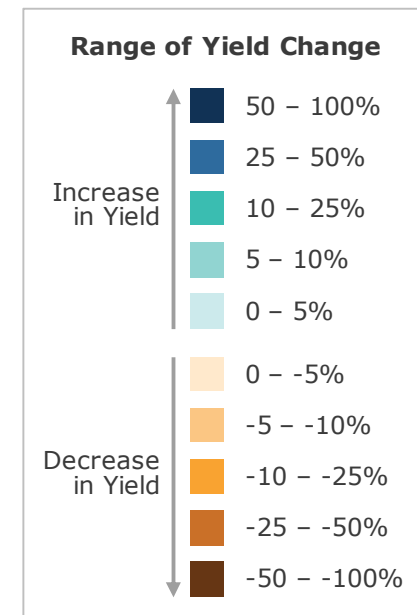
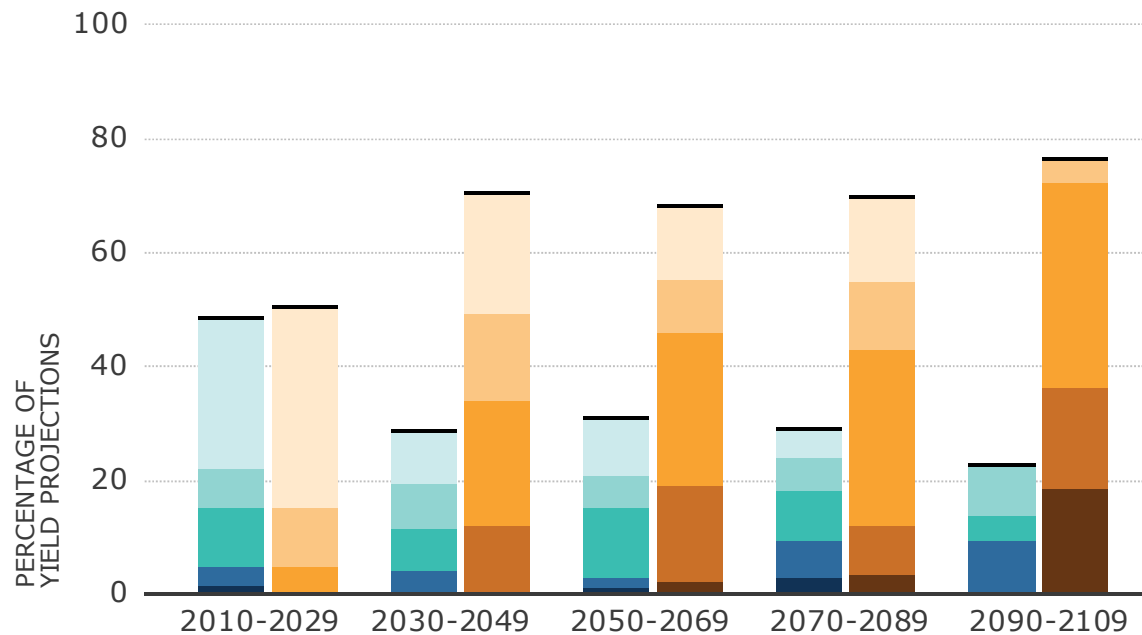
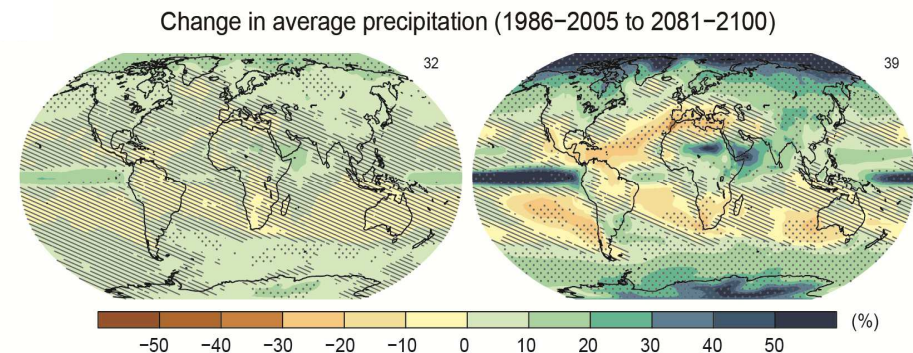
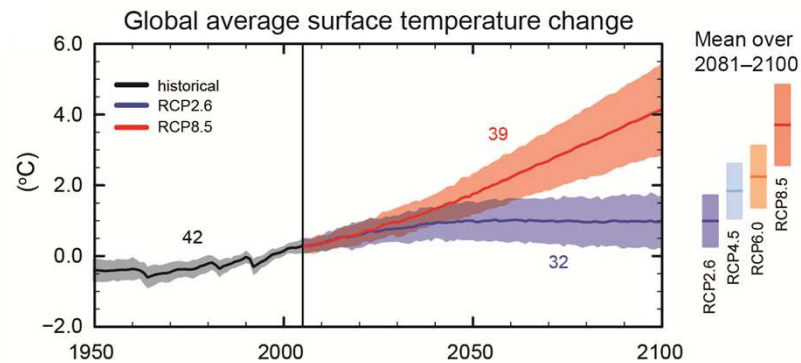
East Africa, Davis et al 2012, (68% suitability reduction by 2080)



## Trends in Kenyan coffee production



# Why coffee production in Central Kenya has been declining?



Source: IPCC (2013)

❑ *Wheeler & von Braun (2013)* demonstrated how climate change could **potentially interrupt progress towards world without hunger....***Ollat et al. (2016)* evidenced the **quality dependence of cash crops on climate.**

❑ Severe droughts and high temperature in arid and semi-arid regions of Kenya have reduced food production (*Kabubo-Mariara & Karanja 2007*). In response to these challenges, there is an **ongoing research and development and policy reform** efforts to expand the adaptive capacity to climate change and then addresses household food security.

## Adaptation needs.....

**Adaptation**: “*The process of adjustment to actual or expected challenges and its effects. It seeks to moderate harm or exploit beneficial opportunities*” (IPCC 2014)

- Different agents (producers, institutions, food industries) and scales (from individual to global scale) (Wreford et al. 2010)
  - Reducing the sensitivity of the affected system
  - Altering the exposure of a system to the impact
  - Increasing the resilience of socio-ecological systems
- Adaptation strategies can be classified (Smit & Skinner 2002):
  - Technological developments
  - Government programs and insurance
  - **Farm production practices**
  - **Farm financial management**



- IS... is the systemic interactional processes that generate and hybridize different forms of knowledge (scientific, tacit, and local know-how) to solve multifaceted environmental problems (Temple et al. 2015). This encompasses two orientations.
  1. A community level, experience based and demand driven innovation implemented by agrarian societies (Touzard et al, 2015) and
  2. the role of scientific knowledge in activating innovation process(Temple et al. 2015b) based on the implementation of proposals for agricultural research (biotechnology, new varieties, agronomic practice).



- The first mode entails informal process of learning based on doing, using and interacting (Jensen et al, 2007) among community members while the other mode is based on the production and use of scientific and technical knowledge which is formally institutionalized and the institutional and organizational variables are those which make these different systems possible and render them coherent (Triomphe et al, 2014; Spielman 2012).
- Indeed, the second orientation is criticized of exclusively meeting the needs of their designers, but not necessarily rural societies' priority development issues and the specificities of locally available resources (Temple et al, 2015).

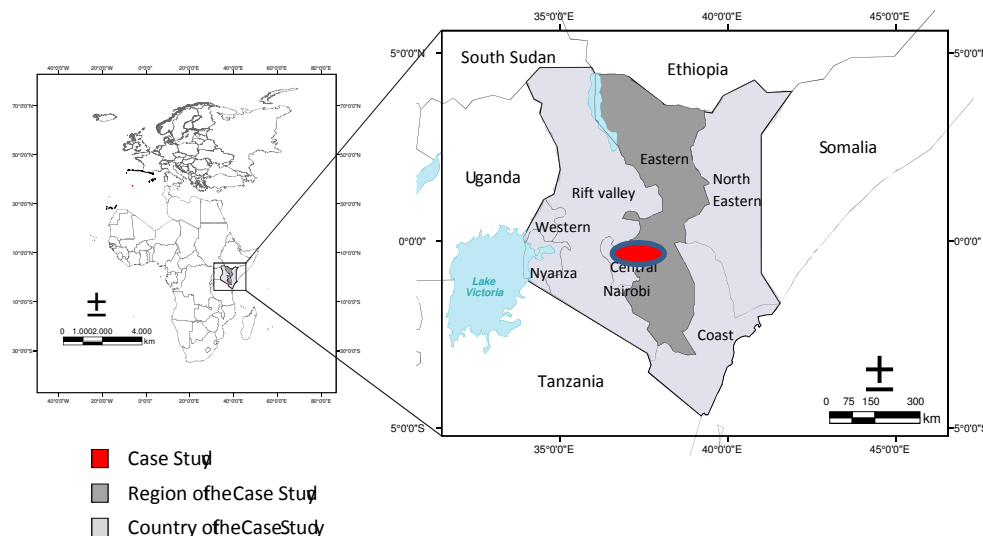
- We, therefore, hypothesized in this study
  - (1) the strategies of adaptation to climate change are dependent on the roles of research .....
  - (2) There is a direct cause-effect relationship between research output and the actual adoption of adaptation strategies to climate change.
  - (3) The meso-level coffee sector defined by the collective strategies of adaptation is not the result of the sum of the individual strategies but it has its own institutional dimension.
  - (4) The strategy to diversify to dairy sector from a complete specialization on coffee improves farmers' adaptive capacity to climate change and brings household level food security.

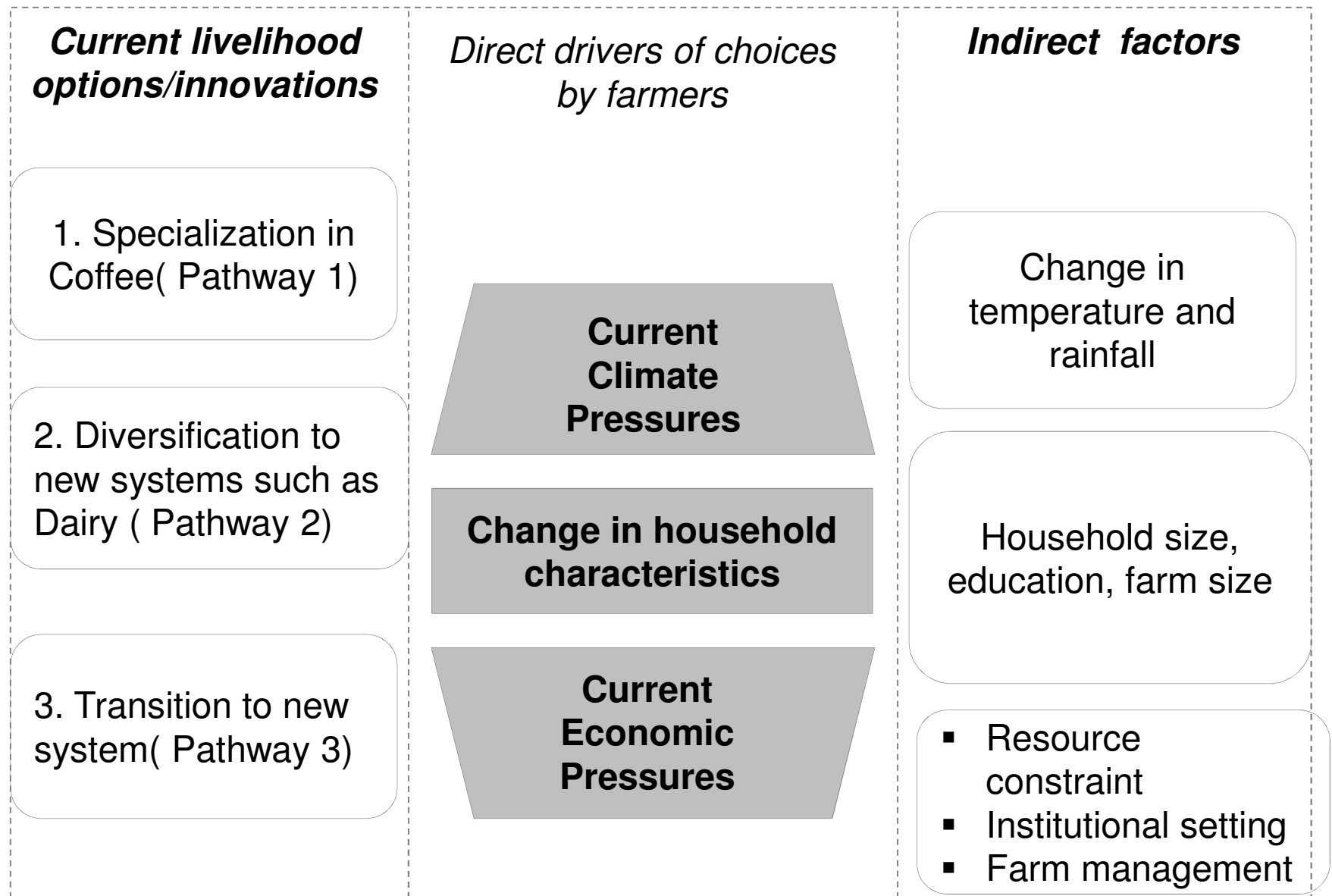
## The area of study: Murang'a County, Kenya

- Subsistence food production(lower altitude), high value crops(high altitude) → small plots of land (Thuku et al. 2012)
- Dominantly rain-fed agriculture
- Moderate to semi-arid climate with two rainy seasons
- Higher temperature and less precipitation (Thornton et al. 2006)

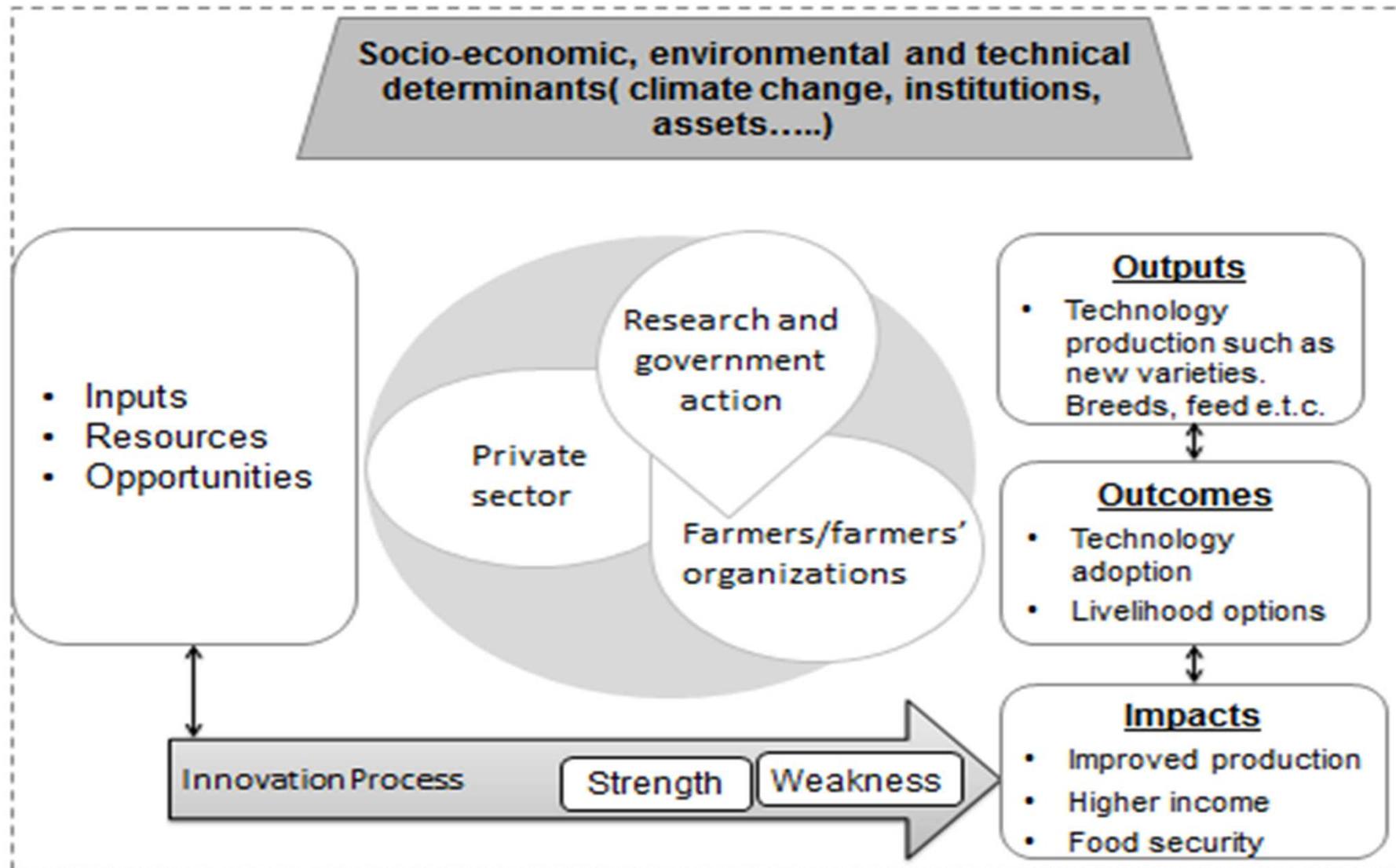
- At least three major agroecologies:

- Highland tea zone
- Midland coffee zone
- Lowland food crops zone
  - Micro zones
  - Intersectional zones

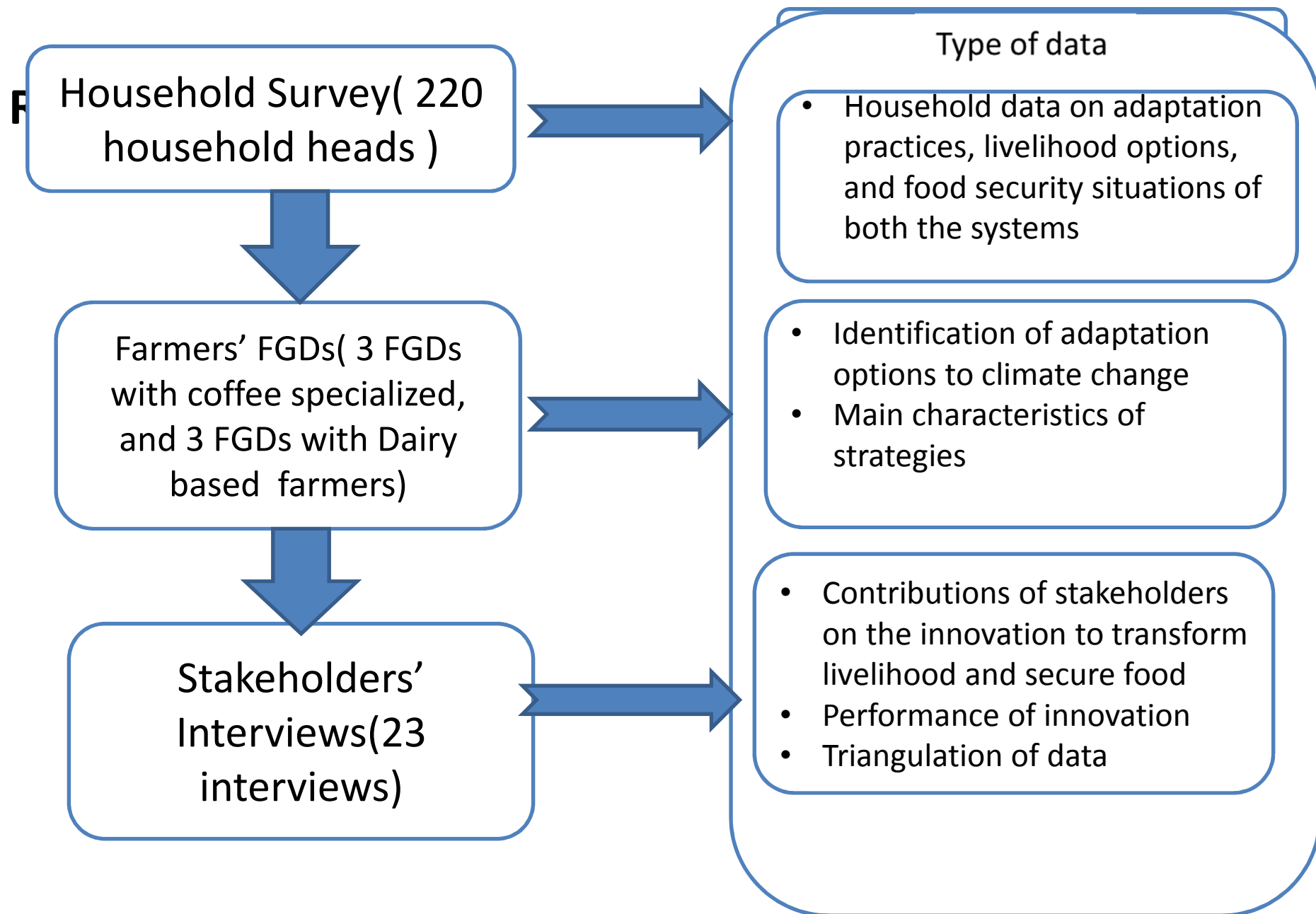




Conceptual Framework(determinants of innovation)



Conceptual model: the process of innovation and impact pathway <sup>13</sup>



## **Defining induced technological innovation**

- ❑ The claim of the central highland that (1) rainfall has declined and temperature has increased (Asayehegn et, 2016); (2) previous potential coffee areas are transformed to marginal coffee or food crops area which is termed as climate induced land use change(Jaramillo et al. 2014); (3) potentially favorable weather zones are transformed in to arid and semi-arid zones (Bilham 2011) are conditions that support to conclude the changes and shifts are climate change induced and adjustments are to adapt the changes.



## **technological innovation**

### **A. Innovation of diseases resistance varieties**

❑ The coffee sector in Kenya possibly studied in three categories of timelines.

#### **1. Pre-independence (before 1963)**

- CR established
- Traditional varieties(SL, K7)

#### **2. 1963-1987**

- Local natives allowed to own
- Large scale firms subdivided
- CRF founded with 2 percent levy
- Annual production increased at a rate of 6.6 percent

- 1966, infestation of CBD and CLR
- Selection of chemicals(zinc, copper..)
- Developing diseases resistance variety
- Ruiru 11 released

### **3. 1988-2014**

- Coffee production collapse by 62 percent
- severity of CBD and CLR
- Social needs and institutional conditions were not adequate
- Extension services, farmers assets and resources were not considered
- Coffee union was liberalized
- Financial and non financial crises to farmers



## **B. Innovation of the Dairy Sector**

- ❑ The dairy sector initiative was mainly on three broad functions. These are (1) Technological development (2) extension and education (feeding, hygiene, value addition) and (3) institutional building for marketing channels.
- ❑ The technological development consist the improvement in breeding qualities and animal health, and access to alternative affordable feed. The extension and education is through the business oriented private sector (veterinarians, feed dealers, health experts).
- ❑ The breeding materials, health services such as AI and medications and innovative new feed systems are primarily developed at the research or directly adapted from abroad but the distribution system has a dual line i.e. the private and the county government.

## 1. **Pre-independence** (before 1963)

- Dairy was export oriented, large scale, owned by foreign settlers
- KCC was established to support production, marketing and processing as sole agent
- Exotic breeds

## 2. **First cycle reform**(1967-1979)

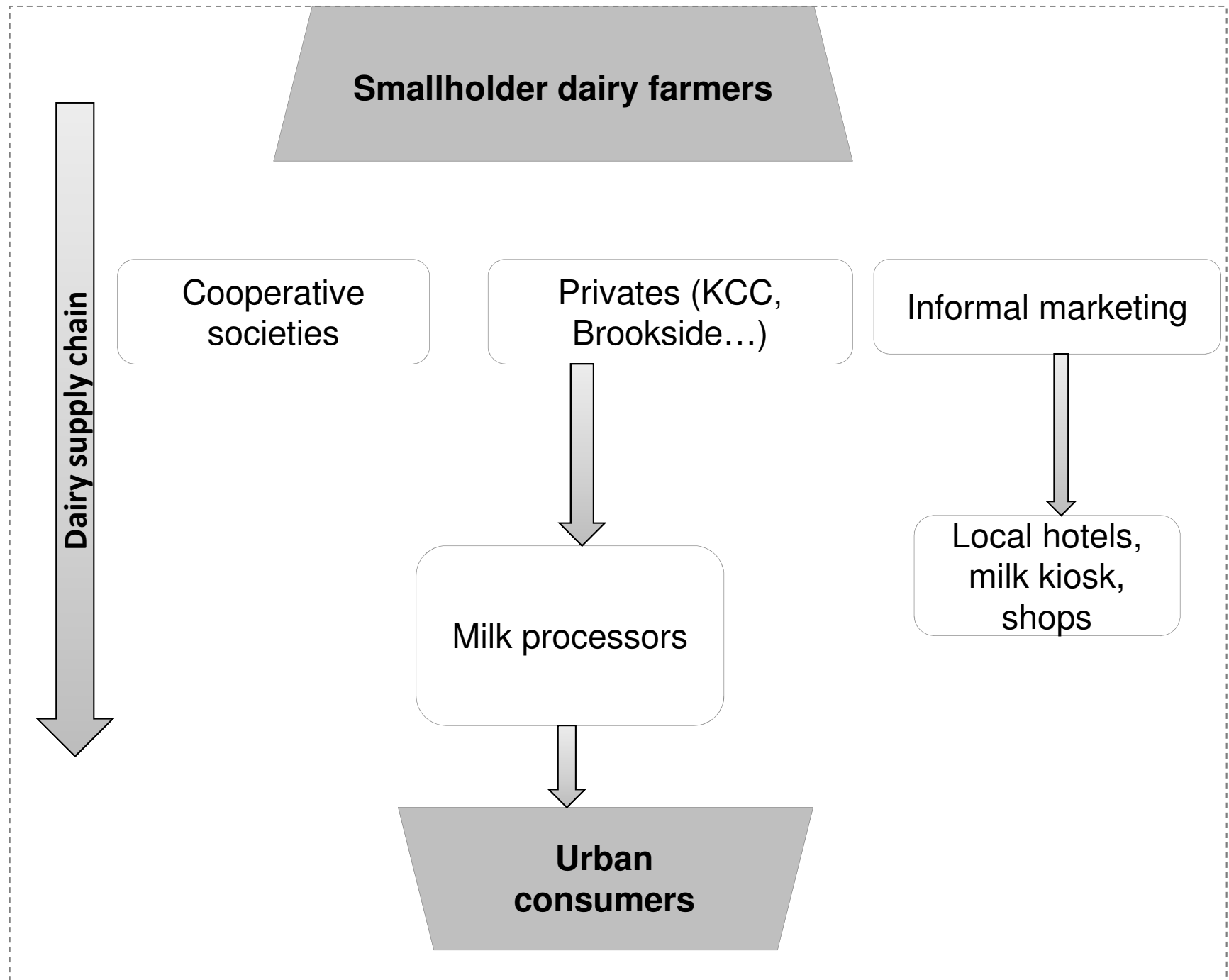
- Sector transferred to indigenous people
- Attention of policy shifted towards smallholders
- Fairly organized breeding system
- Breeding materials used to upgrade the local breeds
- KCC continued to be a sole and autonomous agent
- Production steadily grew

### 3. **Second cycle reform (1980-2002)**

- Period of disruption and collapse
- Failure of marketing agent
- Farmers stopped to supply milk to KCC due to irregular payment and debt
- Liberalization and service delivery interruption
- Public breeding and service cut and insufficient private sector
- Poor incentive of milk, high price of AI, breeding got back to bull
- Emergence of self help groups
- Opportunities for other actors to emerge in the sector was created

### 4. **Period of new impetuse**(since 2003)

- Highly progressive reform
- Administrative and technical solutions
- Infrastructures such as milk cooling depots
- Motivation risen
- Different options for marketing and processing







**CBD=70%**

**CLR=40%**

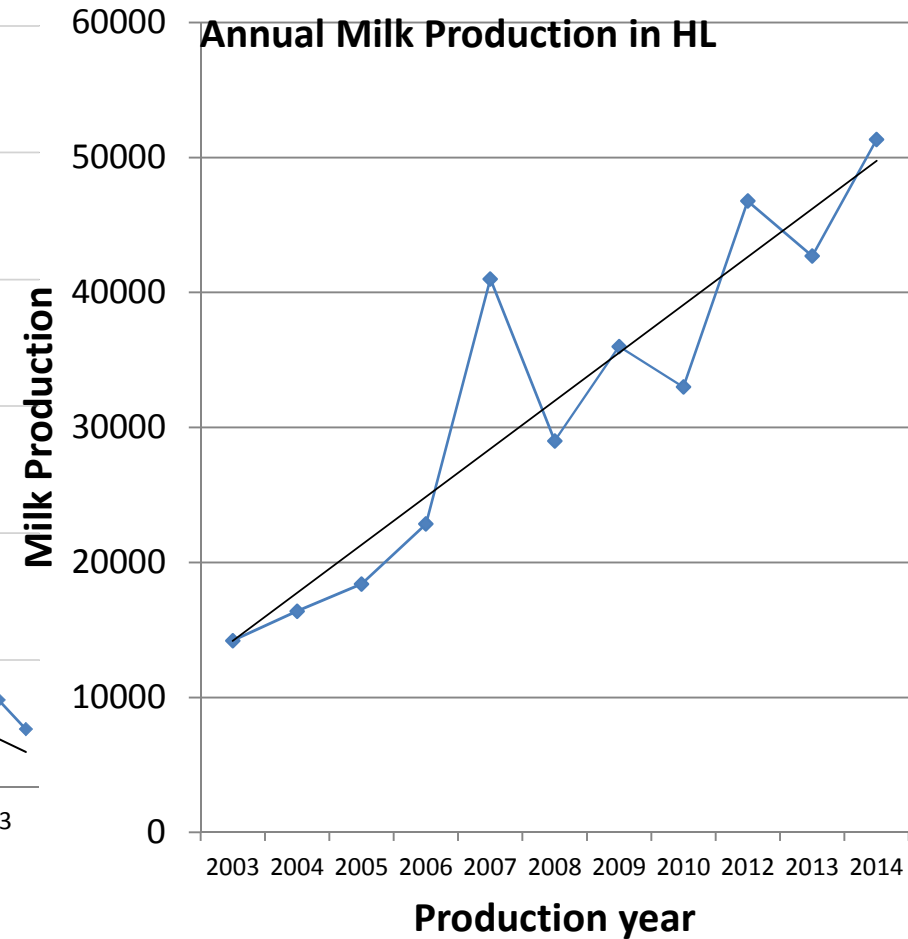
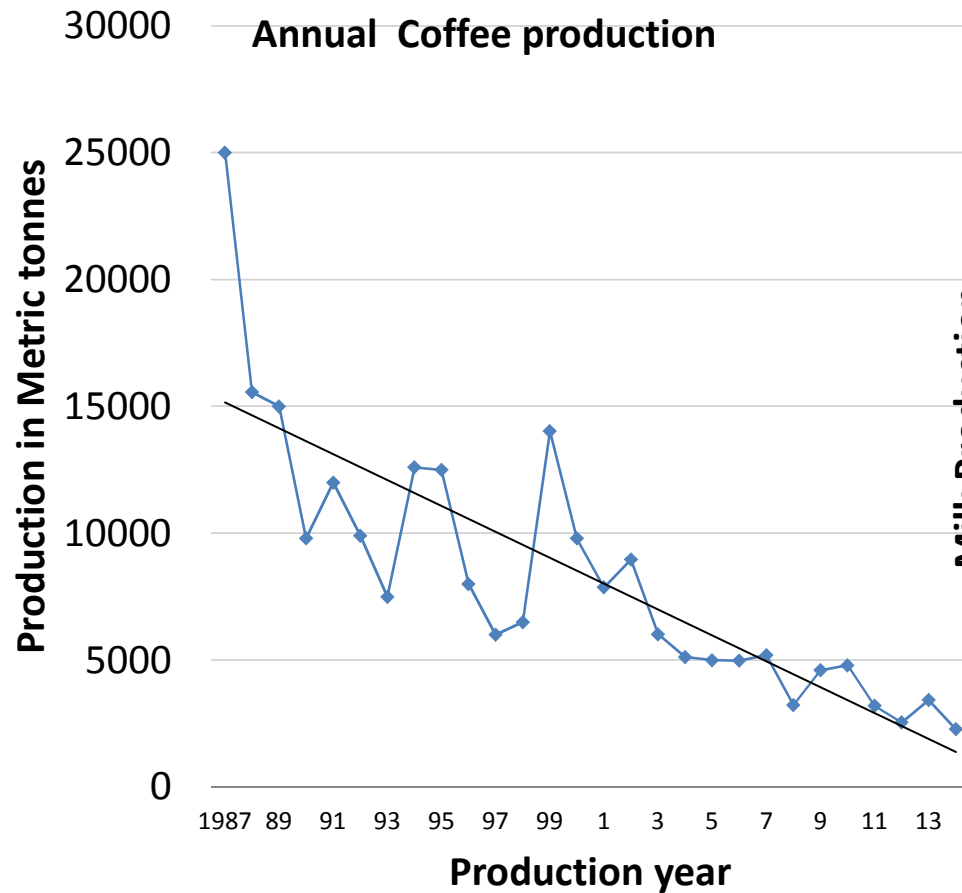
**Input prices=65%**



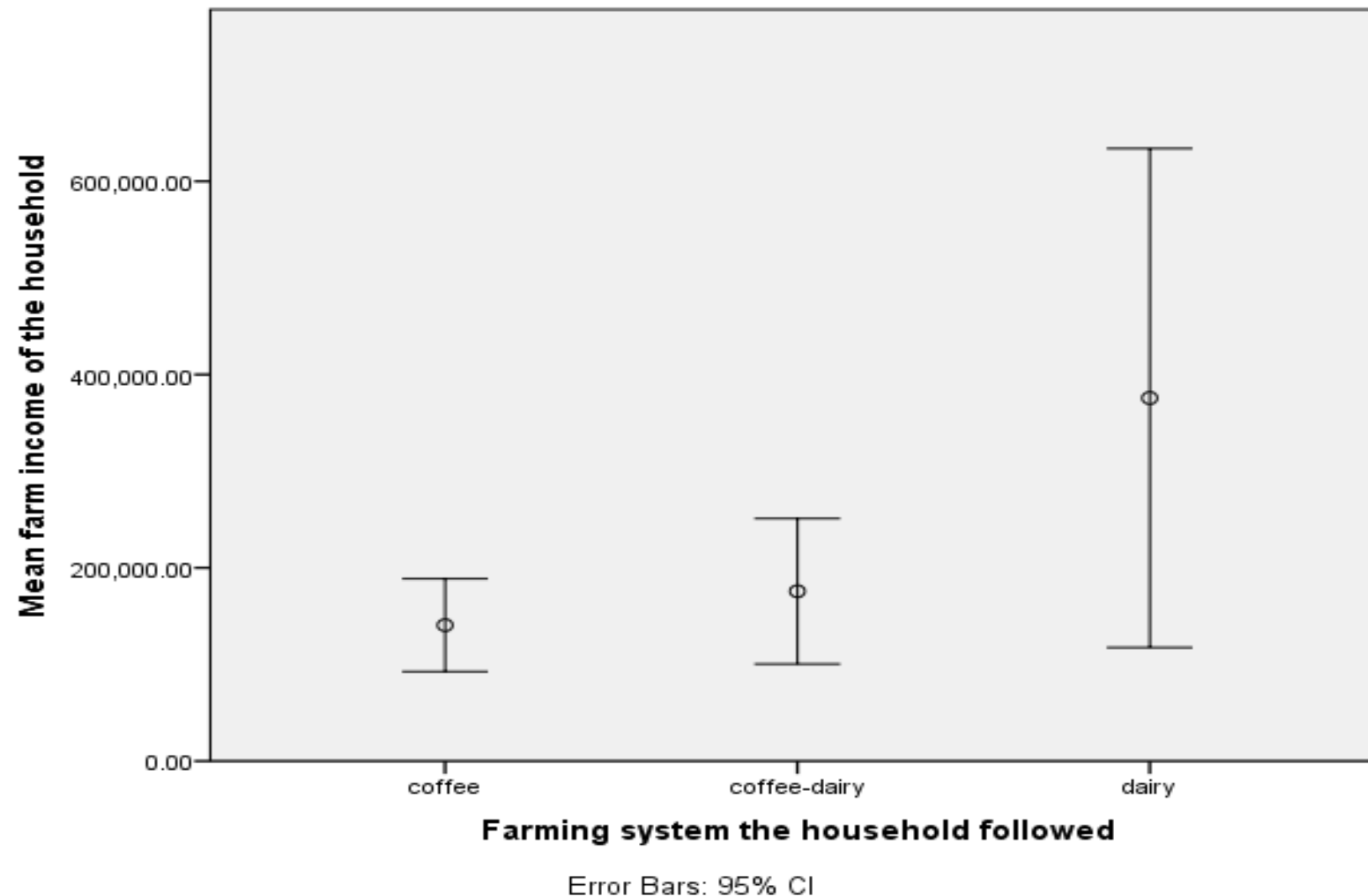
	Zone classification	Altitudes (before)	Current altitude
1	Coffee-tea	1650-1950	1850-2000
2	Potential coffee	1340-1680	1600-1800
3	Marginal coffee	1300-1450	1400-1600
4	Food crops	Lower than 1300	<1450

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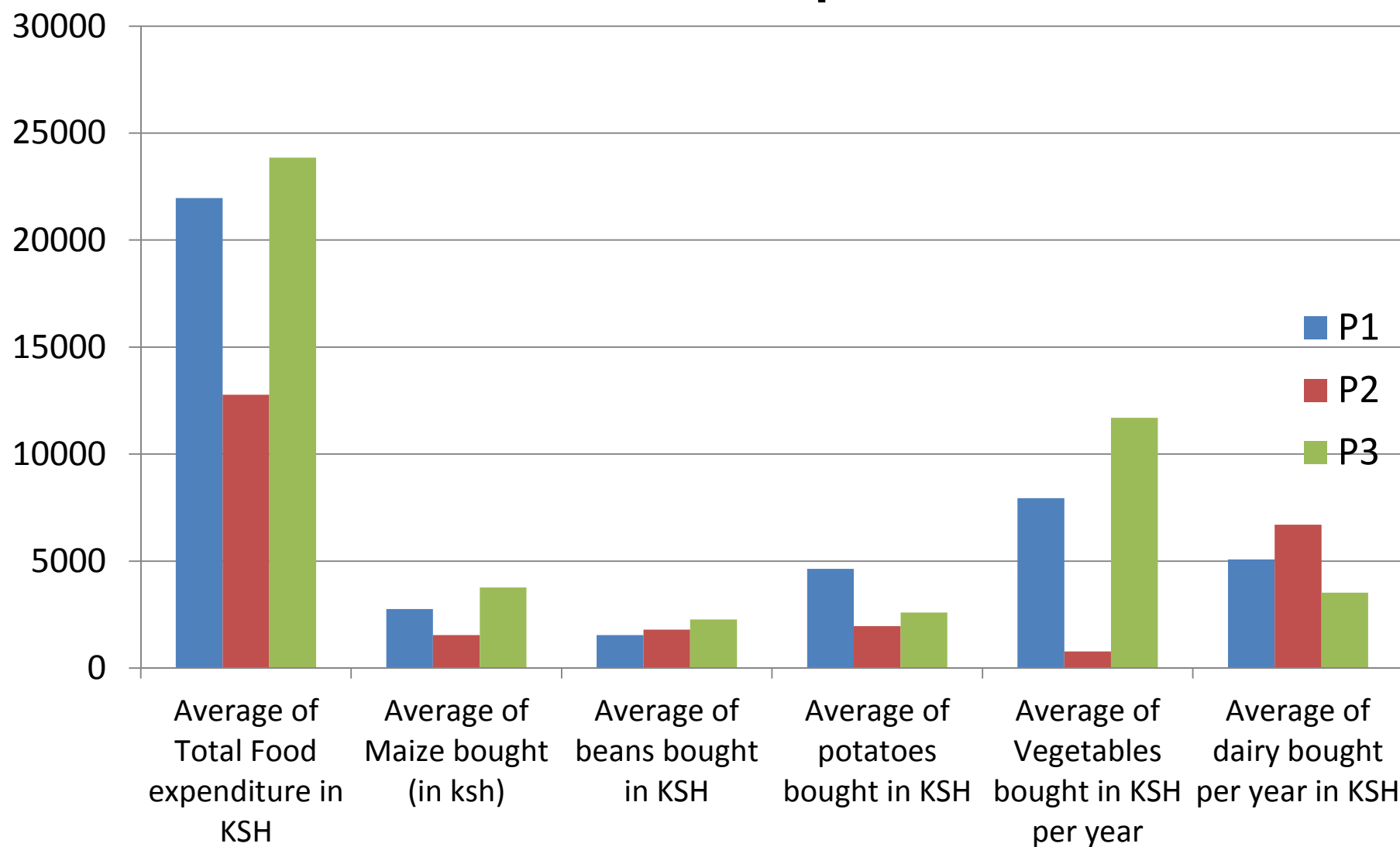
## coffee Vs dairy production in Murang'a County, Kenya



## Food security and farming transition: total household income(proxy)

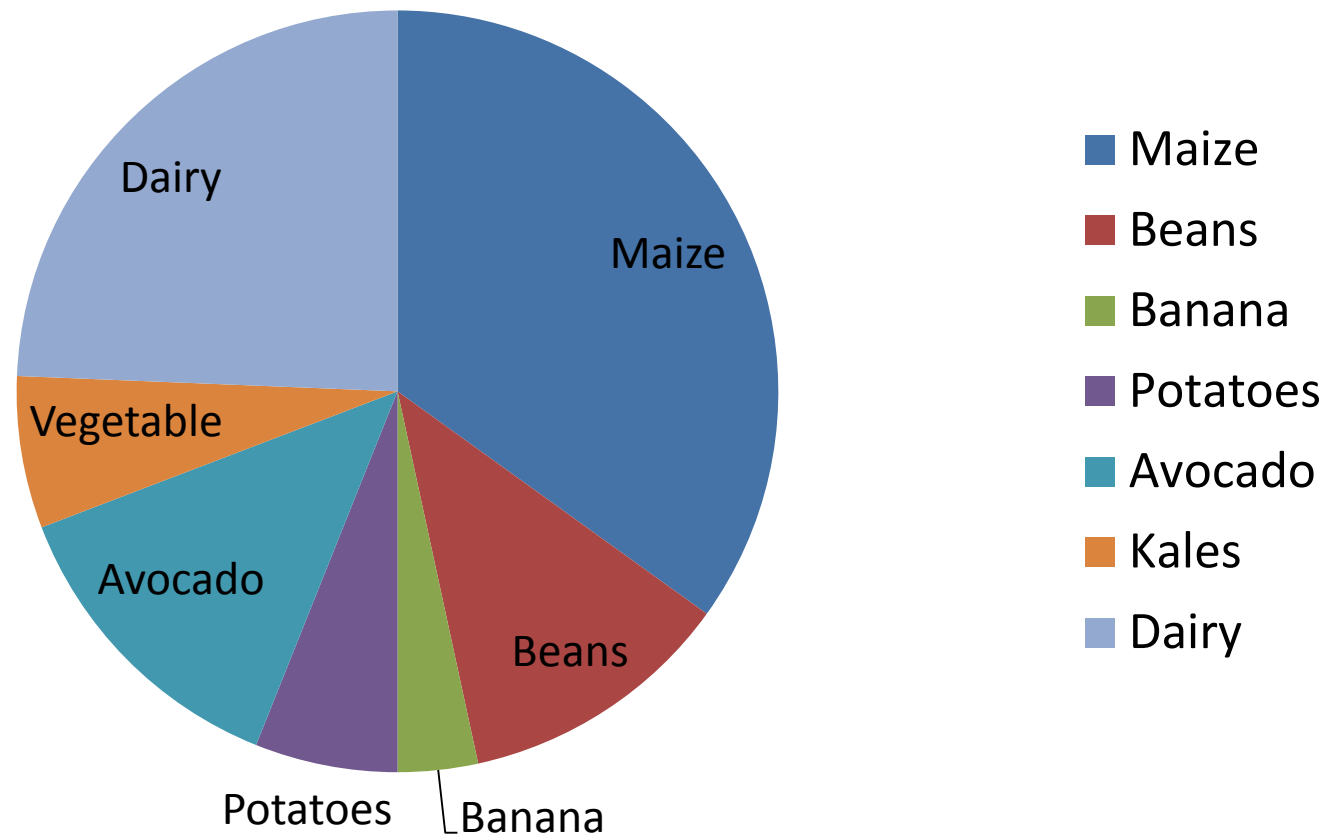


## Household food expenditure



# Nutritional Security

Calorie intake



## Discussion and Conclusions

- ❑ Continuous decline in coffee production
- ❑ The dairy sector is, however, in opposite visualizing sharp increase in volume of production and price.
- ❑ **Determinants**
  - ✓ Changing climate
  - ✓ Household factors
  - ✓ Resource and institutional factors
- ❑ transition from coffee to dairy based farming system brought the system to have three options

- The less household food expenditure by diversified farmers is due to
  - less household income to spend on food;
  - production of own food for consumption
- Dairy and maize takes 65% of calorie intake of family farmers
  - ✓ Dairy specialized farmers are nutritionally secured regardless of self sufficiency



**THANK YOU**

**MERCI**